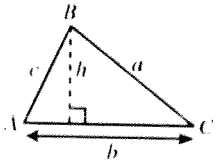
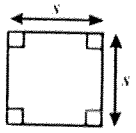
Geometry Formula Sheet
2009 *Mathematics Standards of Learning*

Geometric Formulas

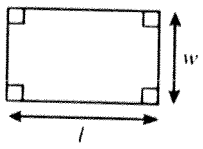


$$A = \frac{1}{2}bh$$

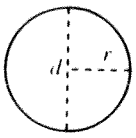
$$A = \frac{1}{2}ab \sin C$$



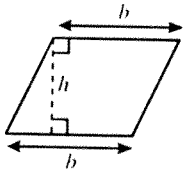
$$p = 4s$$
$$A = s^2$$



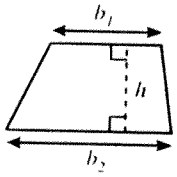
$$p = 2l + 2w$$
$$A = lw$$



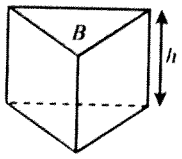
$$C = 2\pi r$$
$$C = \pi d$$
$$A = \pi r^2$$



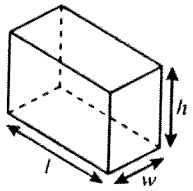
$$A = bh$$



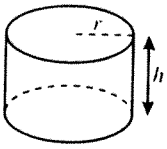
$$A = \frac{1}{2}h(b_1 + b_2)$$



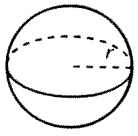
$$V = Bh$$
$$L.A. = hp$$
$$S.A. = hp + 2B$$



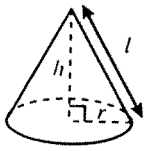
$$V = lwh$$
$$S.A. = 2lw + 2lh + 2wh$$



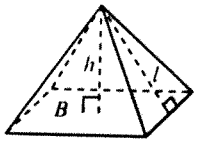
$$V = \pi r^2 h$$
$$L.A. = 2\pi rh$$
$$S.A. = 2\pi r^2 + 2\pi rh$$



$$V = \frac{4}{3}\pi r^3$$
$$S.A. = 4\pi r^2$$



$$V = \frac{1}{3}\pi r^2 h$$
$$L.A. = \pi rl$$
$$S.A. = \pi r^2 + \pi rl$$



$$V = \frac{1}{3}Bh$$
$$L.A. = \frac{1}{2}lp$$
$$S.A. = \frac{1}{2}lp + B$$

Abbreviations

Area	A
Area of Base	B
Circumference	C
Lateral Area	$L.A.$
Perimeter	p
Surface Area	$S.A.$
Volume	V

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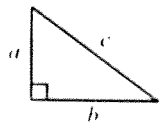
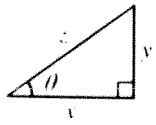


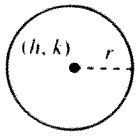
$$a^2 + b^2 = c^2$$



$$\text{Sin } \theta = \frac{y}{z}$$

$$\text{Cos } \theta = \frac{x}{z}$$

$$\text{Tan } \theta = \frac{y}{x}$$



$$(x-h)^2 + (y-k)^2 = r^2$$

Pi

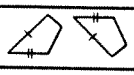
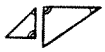
$$\pi \approx 3.14$$

$$\pi \approx \frac{22}{7}$$

Quadratic Formula:

$$x = \frac{b \pm \sqrt{b^2 - 4ac}}{2a}, \text{ where } ax^2 + bx + c = 0 \text{ and } a \neq 0$$

Geometric Symbols

Example	Meaning
$m\angle A$	measure of angle A
AB	length of line segment AB
$\overrightarrow{AB}$	ray AB
	right angle
$\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$	Line AB is parallel to line CD.
$\overline{AB} \perp \overline{CD}$	Line segment AB is perpendicular to line segment CD.
$\angle A \cong \angle B$	Angle A is congruent to angle B.
$\triangle ABC \sim \triangle DEF$	Triangle ABC is similar to triangle DEF.
	Similarly marked segments are congruent.
	Similarly marked angles are congruent.

Geometry – Things to Remember!

3-D Figures:

Prism: $V = Bh$

Pyramid: $V = \frac{1}{3}Bh$

Cylinder: $V = \pi r^2 h$; $SA = 2\pi rh + 2\pi r^2$

Cone: $V = \frac{1}{3}\pi r^2 h$; $SA = s\pi r + \pi r^2$

Sphere: $V = \frac{4}{3}\pi r^3$; $SA = 4\pi r^2 = \pi d^2$

Polygon Interior/Exterior Angles:

Sum of int. angles = $180(n-2)$

Each int. angle (regular) = $\frac{180(n-2)}{n}$

Sum of ext. angles = 360

Each ext. angle (regular) = $\frac{360}{n}$

Related Conditionals:

Converse: switch if and then
Inverse: negate if and then
Contrapositive: inverse of the converse (contrapositive has the same truth value as the original statement)

Pythagorean Theorem:

$c^2 = a^2 + b^2$

Converse: If the sides of a triangle satisfy $c^2 = a^2 + b^2$ then the triangle is a right triangle.

Regular Solids:

Tetrahedron – 4 faces
Cube – 6 faces
Octahedron – 8 faces
Dodecahedron – 12 faces
Icosahedron – 20 faces

Triangles:

By Sides:

Scalene – no congruent sides
Isosceles – 2 congruent sides
Equilateral – 3 congruent sides

By Angles:

Acute – all acute angles
Right – one right angle
Obtuse – one obtuse angle
Equiangular – 3 congruent angles(60°)
Equilateral ↔ Equiangular

Exterior angle of a triangle equals the sum of the 2 non-adjacent interior angles.

Mid-segment of a triangle is parallel to the third side and half the length of the third side.

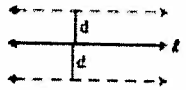
Similar Triangles:

AA
SSS for similarity
SAS for similarity
Corresponding sides of similar triangles are in proportion.

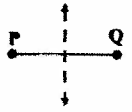
Locus Theorems:

Fixed distance from point.

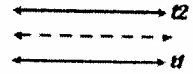
Fixed distance from a line.



Equidistant from 2 points.



Equidistant 2 parallel lines.



Equidistant from 2 intersecting lines

Congruent Triangles

SSS
SAS
ASA
AAS
HL (right triangles only)

NO donkey theorem (SSA or ASS)

CPCTC (use after the triangles are congruent)

Inequalities:

--Sum of the lengths of any two sides of a triangle is greater than the length of the third side.
--Longest side of a triangle is opposite the largest angle.
--Exterior angle of a triangle is greater than either of the two non-adjacent interior angles.

Mean Proportional in Right Triangle:

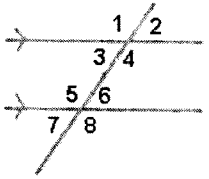
Altitude Rule:

$$\frac{\text{part hyp}}{\text{altitude}} = \frac{\text{altitude}}{\text{other part hyp}}$$

Leg Rule:

$$\frac{\text{hyp}}{\text{leg}} = \frac{\text{leg}}{\text{projection}}$$

Parallels: If lines are parallel …



Corresponding angles are equal.
$m\angle1=m\angle5$, $m\angle2=m\angle6$, $m\angle3=m\angle7$, $m\angle4=m\angle8$
Alternate Interior angles are equal.
$m\angle3=m\angle6$, $m\angle4=m\angle5$
Alternate Exterior angles are equal.
$m\angle1=m\angle8$, $m\angle2=m\angle7$
Same side interior angles are supp.
$m\angle3 + m\angle5=180$, $m\angle4 + m\angle6=180$

Quadrilaterals:

Parallelogram:
opp. sides parallel
opp sides =
opp angles =
consec. angles supp
diag bis each other
Rectangle: add 4 rt angles, diag. =
Rhombus: add 4 = sides, diag. perp, diag bisect angles.
Square: All from above.

Trapezoid:
Only one set parallel sides.

Median of trap is parallel to both bases and = ½ sum bases.
Isosceles Trap:
legs =
base angles =
diagonals =
opp angles supp

Transformations:

$r_{x-axis}(x,y)=(x,-y)$
$r_{y-axis}(x,y)=(-x,y)$
$r_{y=x}(x,y)=(y,x)$
$r_{y=-x}(x,y)=(-y,-x)$
$r_{origin}(x,y)=(-x,-y)$
$T_{a,b}(x,y)=(x+a,y+b)$
$D_k(x,y)=(kx,ky)$
$R_{90°}(x,y)=(-y,x)$
$R_{180°}(x,y)=(-x,-y)$
$R_{270°}(x,y)=(y,-x)$

Glide reflection is composition of a reflection and a translation.

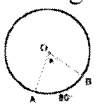
Isometry – keeps length.

Orientation – label order

Circle Segments
In a circle, a radius perpendicular to a chord bisects the chord.
Intersecting Chords Rule:
(segment part)•(segment part) = (segment part)•(segment part)
Secant-Secant Rule:
(whole secant)•(external part) = (whole secant)•(external part)
Secant-Tangent Rule:
(whole secant)•(external part) = (tangent)^2
Hat Rule: Two tangents are equal.

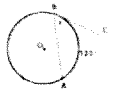
Circle Angles:

Central angle = arc

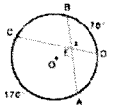


Inscribed angle = half arc

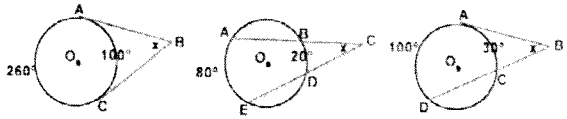
Angle by tangent/chord = half arc



Angle formed by 2 chords = half the sum of arcs



Angle formed by 2 tangents, or 2 secants, or a tangent/secant = half the difference of arcs



Slopes and Equations:

$$m=\frac{vertical\ change}{horizontal\ change}=\frac{y_2-y_1}{x_2-x_1}.$$

$y=mx+b$ slope-intercept

$y-y_1=m(x-x_1)$ point-slope

Coordinate Geometry Formulas:

Distance Formula:

$$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$

Midpoint Formula:

$$(x,y)=\left(\frac{x_1+x_2}{2},\frac{y_1+y_2}{2}\right)$$

Circles:

Equation of circle center at origin:
$x^2+y^2=r^2$ where r is the radius.
Equation of circle not at origin:
$(x-h)^2+(y-k)^2=r^2$ where (h,k) is the center and r is the radius.